



Systems programming

2 – System

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Bibliography

- A Unified Formalism for Complex Systems Architecture
 - Section 1.3
 - http://www.lix.polytechnique.fr/~golden/systems_architecture.html
 - <http://www.lix.polytechnique.fr/~golden/research/phd.pdf>



System

System

- From Wikipedia
 - A system is a set of interacting or interdependent components forming an integrated whole
 - Delineated by its spatial and temporal boundaries
 - Surrounded and influenced by its environment
 - Described by its structure and purpose
 - Expressed in its functioning



Ecosystem

- Ecosystem is an ecological systems.
 - includes all the living things in a given area,
 - interacting with each other, and with their non-living environments
- Each organism has its own niche or role to play.
- Community of organisms and their physical environment
 - interacting together.
- The living and physical components are linked together through nutrient cycles and energy flows.



Social system


- Interdependent set of cultural and structural elements
 - that can be thought of as a unit.
- Embodies one of the most important sociological principles:
 - that the whole is more than the sum of its parts.
- A social system refers to a complex network of interrelated social entities,
 - that interact and influence one another within a shared environment or society.
- Interactions are guided by norms, values, roles and patterns of behavior
- Exhibit patterns of organization, stability, and adaptation
 - serving various functions and purposes within society.

Systems architecture

- Generic discipline to handle systems
 - To support reasoning about its properties
- Systems Architecture can refer to
 - the actual architecture of a system
 - i.e. a model to describe/analyze a system
 - architecting (designing) a system
 - i.e. a method to define the architecture of a system
 - body of knowledge for "architecting" systems to meet business needs
 - i.e. a discipline to master systems design.



Systems architecture

- architecture of a system is
 - a global model of a real system
 - Consists of:
 - Structure
 - Properties of various elements involved
 - Relationships between various elements
 - Behaviors and dynamics
 - Multiple views of elements
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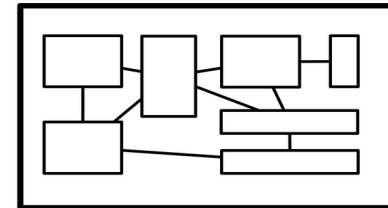
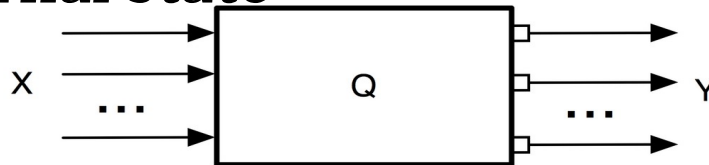


System principles



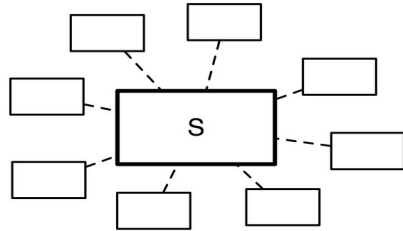
Fundamental principles

- The objects of the reality are modeled as systems
 - objects perform function defined by its perimeter, inputs, outputs and an internal state
- Systems can be broken down into a set of smaller subsystems,
 - Which are less than the whole system
 - Composition emerges new behaviors

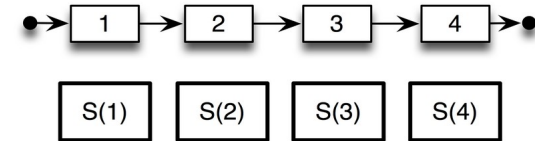


Fundamental principles

- Systems must be considered interacting with other systems
 - Its environment
 - Other systems

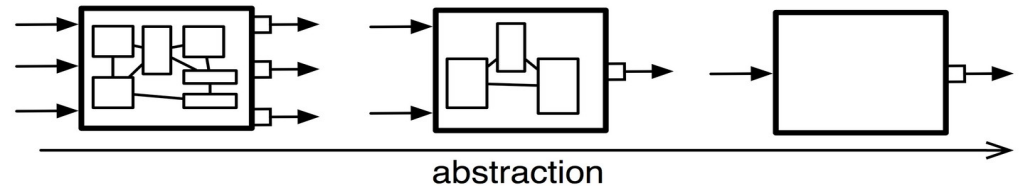
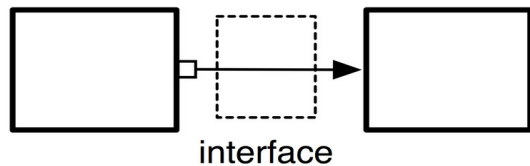


- Systems must be considered through its whole life-cycle
 - From the moment it starts being designed, produced, operated, disposed



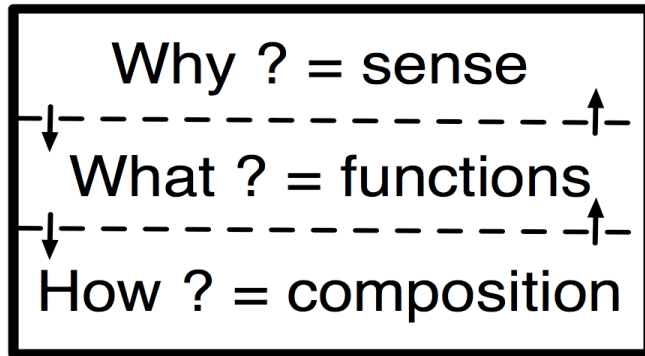
Fundamental principles

- Systems can be linked to another through an interface,
 - Which models the properties of the link
- Systems can be considered at various abstraction levels,
 - Allowing only relevant properties/behaviors to be considered



Fundamental principles

- Systems can be viewed according to various layers

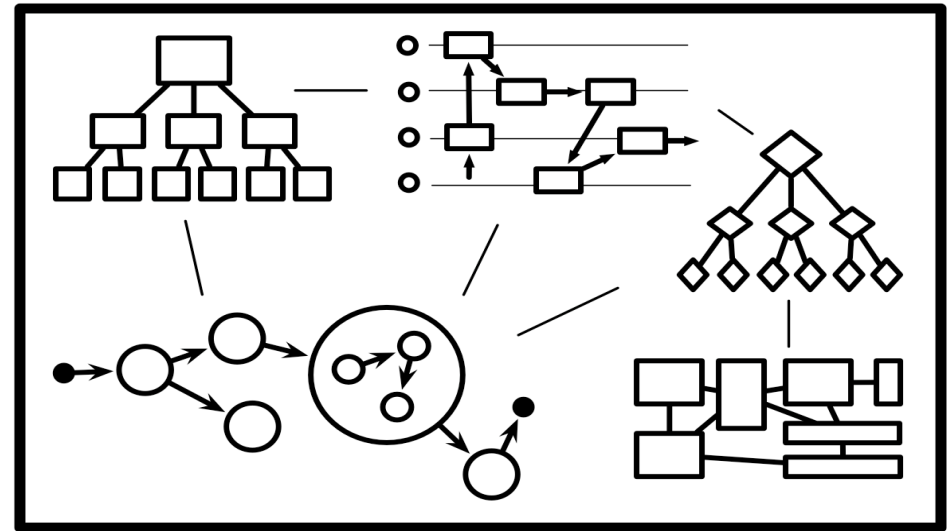


- Sense
 - Why is it being produced / offered functionality
- Functions
 - Operations to fulfill offered functionality
- Composition
 - Definition of components necessary to implement the functions

Fundamental principles

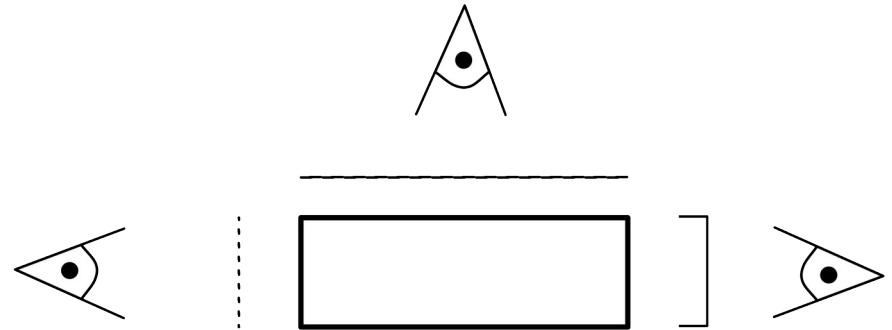
- Systems can be described through interrelated models with given semantics
 - Properties that the system should provide / requirements
 - Structure of the various components and how they interact
 - States of the system
 - Behaviors of the system
 - Manipulated data, etc

- Described with SysML



Fundamental principles

- Systems can be described through different viewpoints
 - corresponding to various actors concerned by the system.
- All visions are important
 - define the system in complementary ways.
- Different stakeholders
 - commercials, designers, software engineers, electronic enginners, usability, users, repairers ...



Next on PSIS

- Systems' requirements
 - IEEE Guide for Developing System Requirements Specifications – IEEE 1233
 - IEEE Recommended Practice for Software Requirements Specifications – IEEE 830